

REMARKS

By this Amendment, claim 20 is canceled; claims 12 and 14 are amended; and new claims 21-30 are added. Reconsideration of the May 12, 2003, Official Action is respectfully requested in view of the above amendments and the following remarks.

1. Restriction Requirement

Claims 1-11 and 15-18 stand withdrawn from consideration as being directed to non-elected subject matter.

2. Objection to Claims

Claims 14 and 20 were objected to as being dependent from non-elected claim 1. To address this objection, claim 14 has been amended to depend from elected claim 12, and claim 20 has been canceled. Accordingly, withdrawal of the objection is respectfully requested.

3. Rejection Under 35 U.S.C. §112, ¶2

Claim 12 stands rejected under 35 U.S.C. § 112, ¶2. The rejection is respectfully traversed.

It is asserted that claim 12 is indefinite because it recites both "open" language ("comprising" at line 3), and "closed" language ("less than 2% by weight of inevitable impurities"). The Official Action states that the claims have been interpreted "as being open when considering the prior art (i.e. non-claimed components may be present in the claim and are not limited to less than 2%, which is the amount that the 'inevitable impurities' are limited)." Applicants confirm that the composition of the nickel based powdered metallic material recited in claim 12 is open, *i.e.*, this material can comprise

components in addition to those that are recited. It is respectfully requested that the rejection be withdrawn.

4. Rejections Under 35 U.S.C. §103

A. Claims 12, 13 and 19 stand rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 2,936,229 to Shepard in view of U.S. Patent No. 5,234,510 to DuBois. The rejection is respectfully traversed.

Claim 12 is directed to a method of forming a wear resistant surface coating on a cast iron substrate, which comprises, *inter alia*, "providing a nickel based powdered metallic material comprising in addition to nickel 0 - 4.5 % by weight of copper, 0-5.0 % by weight of iron, whereby the total amount of copper and iron is at least 2.5 % by weight, 0.05-5.0 % by weight of a carbide forming element, 0.5-2.0 % by weight of boron, 1.0-4.0 % by weight of silicon, 0.5-4.0 % by weight of phosphorus, 0.01-0.5 % by weight of C and less than 2 % by weight of inevitable impurities." The combination of Shepard and DuBois fails to suggest the method recited in Claim 12.

Shepard discloses spray-weld nickel-base and cobalt-base alloys. Shepard provides an upper TABLE at column 2 showing compositions of spray-weld alloys of boron, nickel type (*see* page 4 of the Official Action). The upper TABLE includes five columns; the first column gives broad ranges for the elements Si, B, Cu, Mo, Cr, C, and Fe. However, the first column at the least provides no suggestion that the amount of copper is 0-4.5 % by weight, the amount of iron is 0-5.0 % by weight, *and* the total amount of copper and iron is at least 2.5 % by weight. In fact, the total amount of copper and iron can be zero in the

first column. As explained at page 3, lines 5-21, of the present specification, total amounts of copper and iron of less than 2.5 % do not provide beneficial effects on viscosity.

The compositions disclosed in Columns 2-4 of the upper TABLE each have, for example, a copper content of 5-6 % by weight, which exceeds the amount of copper recited in claim 12.

Moreover, Shepard discloses that the alloys shown in the upper TABLE have been subject to a serious defect (column 2, lines 51-52); namely, "after fusing, small isolated pores appear occasionally in the coatings and are frequently uncovered by a finishing or grinding operation" (column 2, lines 53-55). Accordingly, Shepard teaches away from the alloys shown in the upper TABLE because they are subject to a *serious* problem.

Further, the nickel based powdered metallic material recited in claim 12 includes 0.5-4.0 % by weight of phosphorus. The Official Action admits that Shepard fails to disclose the inclusion of phosphorus.

For at least the foregoing reasons, the compositions disclosed in the upper TABLE of Shepard do not suggest the nickel based powdered metallic material recited in claim 12.

The nickel alloys disclosed in Examples 1 and 3-5 at columns 5-6 of Shepard also fail to suggest the nickel based powdered metallic material recited in claim 12 for reasons in addition to not including phosphorous. For example, the nickel alloys of Examples 1, 4 and 5 each include at least one element in an amount outside of claim 12. Example 3 discloses a 50-50 mechanical mixture of two different alloy powders, each optionally including at least 16% by weight of Cr. The second alloy powder also includes 3-10 % by weight of Mo. Accordingly, the mechanical mixture contains 1.5-5 % by weight of Mo

and optionally at least 16 % by weight Cr. Shepard does not suggest that the mechanical mixture may contain 0.05-5.0 % by weight of a carbide forming element, as recited in claim 12, much less that any advantage can be achieved by this range of carbide forming element. *See*, page 3, line 23 - page 4, line 7, of the present specification, regarding the range of the carbide forming element recited in claim 12.

However, the Official Action asserts that DuBois discloses a nickel-based powder coating composition including 0.5-4.5% phosphorus, and that it allegedly would have been obvious to modify Shepard to include phosphorus as disclosed by DuBois. Applicants respectfully disagree.

DuBois discloses nickel alloys that contain boron, silicon and phosphorus. Nominal and preferred alloy compositions are disclosed at column 2, lines 25-34. DuBois discloses that phosphorous is a critical constituent in the alloys because it substantially eliminates the formation of boro silicates in the final surfacing coating when formed on a substrate (column 3, lines 9-13). Shepard discloses that boron and silicon provide fluxing properties in the nickel-base alloys (column 1, lines 15-21). It is submitted that DuBois provides no motivation to modify Shepard's nickel-base alloys by incorporating phosphorous to eliminate the formation of boro silicates.

Also, DuBois discloses that the "broad ranges of constituents set forth above *are critical to the present invention*" (column 3, lines 67-68; emphasis added). In other words, DuBois discloses that the nickel alloys contain B, Si and P, and that it is critical that the amounts of B, Si and P in the alloys be within the broad disclosed ranges. Thus, the critical amount of phosphorous included in DuBois' alloys is based on the critical amounts

of B, Si (and balance Ni) in the alloys. DuBois does not suggest that the nickel alloys may contain any constituents in addition to Ni, B, Si, and Ni (other than possibly inevitable impurities). Accordingly, DuBois does not suggest that the disclosed phosphorous addition would be suitable for nickel-base alloys with different compositions than DuBois' alloys, much less for the alloy compositions disclosed by Shepard.

For the foregoing reasons, the combination of Shepard and DuBois fails to render obvious the method recited in claim 12. Dependent claims 13 and 19 also are patentable over the cited references for at least the same reasons as claim 12. Therefore, withdrawal of the rejection is respectfully requested.

B. Claims 12, 13 and 19 stand rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 2,875,043 to Tour in view of DuBois. The rejection is respectfully traversed.

Tour discloses spray-weld alloys of the boron-silicon-nickel type. The TABLE at column 3 of Tour shows typical component ranges of the alloys (*see* page 7 of the Official Action). The TABLE includes five columns, with the first column giving broad ranges for the elements Si, B, Cu, Mo, Cr, C, and Fe (the balance being Ni). The Official Action admits that Tour does not suggest that the alloys contain phosphorus. In addition to this omission, the compositions shown in Columns 2-4 of the TABLE each have, for example, copper and boron contents that exceed the amount of copper and boron recited in claim 12.

The nickel alloys disclosed in Examples 1-4 at columns 4-6 of Tour also fail to suggest the nickel based powdered metallic material recited in claim 12. For example, the nickel alloys of Examples 1-4 each have a boron content falling outside of claim 12, in addition to not including phosphorous.

Despite these omissions, the Official Action alleges that it would have been obvious to modify Shepard's nickel-base alloys to include phosphorus as disclosed by DuBois. As explained above, however, DuBois does not suggest that the disclosed phosphorous addition would be suitable for nickel-base alloys having different compositions than DuBois' alloys, much less for Tour's alloy compositions.

For the foregoing reasons, the combination of Tour and DuBois fails to render obvious the method recited in claim 12. Dependent claims 13 and 19 also are patentable over the cited references for at least the same reasons as claim 12. Therefore, withdrawal of the rejection is respectfully requested.

5. New Claims

New claims 21-25 depend from claim 12 and, accordingly, also are patentable for at least the same reasons that claim 12 is patentable.

New independent claim 26 recites a method of forming a wear resistant surface coating on a substrate, which comprises, *inter alia*, "providing a nickel based powdered metallic material comprising nickel, 0-4.5 % by weight of copper, 0-5.0 % by weight of iron, the total amount of copper and iron being at least 2.5 % by weight, *0.05-5.0 % by weight of a carbide forming element, the carbide forming element including at least chromium*, 0.5-2.0 % by weight of boron, 1.0-4.0 % by weight of silicon, 0.5-4.0 % by weight of phosphorus, 0.01-0.5 % by weight of C, and inevitable impurities" (emphasis added). For reasons stated above, it is respectfully submitted that the method recited in claim 26 also is patentable.

Dependent Claims 27-30 also are patentable for at least the same reasons that Claim 26 is patentable, as well as for additional reasons stated below.

Dependent Claim 27 recites that "the nickel based powdered metallic material *consists essentially of* nickel, 0-4.5 % by weight of copper, 0-5.0 % by weight of iron, whereby the total amount of copper and iron is at least 2.5 % by weight, 0.05-5.0 % by weight of the carbide forming element, 0.5-2.0 % by weight of boron, 1.0-4.0 % by weight of silicon, 0.5-4.0 % by weight of phosphorus, 0.01-0.5 % by weight of C, and inevitable impurities" (emphasis added).

Shepard discloses that at least substantially 0.2% of aluminum *is required* as an addition by weight of the total self-fluxing alloy to eliminate pores from the ultimately fused spray-welded coating (column 4, lines 12-16). However, such amounts of aluminum are excluded by claim 27.

Tour discloses that the nickel alloys contain at least 3 % by weight of molybdenum. Tour does not suggest a nickel alloy that contains chromium, but contains 0.05-5.0 % by weight of a carbide forming element. *See, for example*, the alloy compositions disclosed at columns 2-4 of the TABLE and Examples 1-4. Claim 27 is patentable also for these additional reasons.

Dependent claim 28 recites that "the carbide forming element is free of molybdenum." Support is provided at Tables 1 and 2, at page 8 of the present specification. In contrast, Tour's alloys contain at least 3 % by weight of molybdenum. Claim 28 is patentable also for these additional reasons.

Dependent claim 29 recites that "the carbide forming element consists essentially of chromium." Support is provided at Tables 1 and 2 of the present specification. Shepard does not does suggest a nickel-base alloy containing 0.05-5.0 % by weight of a carbide forming element, which consists essentially of chromium. Tour's alloys contain at least 3 % by weight of molybdenum. Claim 29 is patentable also for these additional reasons.


Dependent claim 30 recites that "the nickel based powdered metallic material comprises 0.05-1.0 % by weight of the carbide forming element." Shepard fails to suggest a nickel-base alloy containing 0.05-1.0 % by weight of a carbide forming element. Tour's alloys contain at least 3 % by weight of molybdenum. Claim 30 is patentable also for these additional reasons.

6. Conclusion

For the foregoing reasons, it is submitted that the application is in condition for allowance and such action is earnestly solicited.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

By: 
Edward A. Brown
Registration No. 35,033

P.O. Box 1404
Alexandria, Virginia 22313-1404
703-836-6620

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